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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/077,036	02/15/2002	Michael Andrew Parker	SJO919990205US1	1965

7590 11/18/2003

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EXAMINER	
JOHNSTON, PHILLIP A	
ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 11/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/077,036	PARKER ET AL.
	Examiner	Art Unit
	Phillip A Johnston	2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspond nce address --

P riod for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 02 October 2003.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-69 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-69 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 15 February 2002 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Detailed Action

Examiners Response to Arguments

Claims Rejection – 35 U.S.C. 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-69 stand as rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Pub. No. 2002/0059047 to Haaland, in view of Obremski, U.S. Patent No. 5,498,875, and in further view of Gupta, U.S. Patent No. 5,319,586 for the reasons given in First Office Action.

3. Applicant's arguments filed 10-02-2003 have been fully considered but they are not persuasive.

Argument 1.

Applicant states “because Haaland does not suggest transforming a plurality of sequential spectra obtained from a spectrometer to provide an array of drift-compensated row vectors, Haaland cannot suggest performing a factor analysis on the array of row vectors (i.e., drift compensated row vectors) to provide a set of principal factors compensated for effects of drift. Moreover, because Haaland does not suggest transforming a plurality of sequential spectra, obtained from a spectrometer to provide an array of drift-compensated row vectors and does not suggest performing a factor analysis on the array of row vectors (i.e., drift-compensated row vectors) to provide a set of principal factors compensated for effects of drift, Haaland cannot suggest generating compositional profiles compensated for the effects of drift from the set of principal factors.

Obremski fails to remedy the deficiencies of Haaland. Obremski focuses on a method for determining analyte content of a sample using techniques such as target factor analysis. Nowhere in Obremski is the subject of transforming sequential spectra or drift mentioned. Thus, Obremski also does not teach, "transforming sequential spectra obtained from a spectrometer to provide an array of drift-compensated row vectors.”

The applicant is respectfully directed to Obremski (875); Column 10, line 62-67; and Column 11, line 1-42 , which states, Experimental data representing the output signals 18a and 18b can be processed in the distinguishing means 22 by any one or more of classical least squares, inverse least squares, principal component regression, and partial least squares.

The data is processed both in a time domain and as raw spectra. As a measure of accuracy of each technique, the Standard Error of Estimate (SEE) and Standard Error of Prediction (SEP) are determined.

An inverse least squares method is based on the classical least squares method. A single matrix inversion is required during the calibration step and no constraints are placed on the number of components, wavelengths, or mixtures used in the calculations. Inverse least squares minimizes variance in concentration.

Spectroscopic measurements have some uncertainty. If the predominant uncertainty is not in the in the spectroscopic data, then the inverse least squares method is preferred. Otherwise, the classical least squares method is preferred. The fewer matrix inversions required by the inverse least squares approach tend to outweigh the potential benefits of a change in coordinates during the regression steps. Inverse least squares is the preferred method because of greater resistance to problems with near singular matrices.

The problems of matrix singularity in multiple linear regression determinations is reduced by using orthogonalization methods. This is an eigenvector analysis by singular value decomposition, or factor analysis. An orthogonal matrix is one where all the column vectors are mutually perpendicular. Orthogonalization of a matrix prior to an inverse least squares method permits inversion of the matrix without singularity problems. This technique is principal component regression. This technique is also known as P-matrix method, target transform factor analysis or target factor analysis.

Orthogonalization of a matrix prior to classical least squares also permits determination of an unknown matrix without singularity problems. A second orthogonalization process is required to permit prediction of unknown concentrations when a first matrix is not square.

The number of eigenvectors used in the principal component regression calculations is that which yields the lowest Standard Error of Prediction values with a particular data set. The eigenvectors are determined empirically for each combination of data set and pretreatment method. Increasing numbers of eigenvectors in the basis set lowers the Standard Error of Estimate since there are more degrees of freedom used in the model.

The applicant is also respectfully directed to Obremski (875); Column 12, line 31-49, which states, Emission spectra were obtained using 750 nm diode laser excitation of the near infrared fluorophore HDITCP to obtain changes in spectral amplitude for a series (sequential spectra) of samples scaled to nine different dye concentrations. This is illustrated in FIG. 6A, which shows the spectra generated by scaling HDITCP emission spectrum after a sample excitation at a 750 nm wavelength. These spectra indicate output signals, which are associated because their spectra vary uniformly with analyte concentration. "Associated" signals are two or more apparently different output signals which vary with the concentration of analyte in a uniform and/or predictable manner.

A similar series of spectra were developed for a 790 nm excitation wavelength, and are illustrated in FIG. 6B. These spectra also indicate output signals, which are associated because their spectra vary uniformly with analyte concentration.

The examiner has interpreted from the Obremski (875) references above, that the Obremski (875) spectrometer was utilized to obtain a series of spectra; i.e. sequential spectra. In addition these spectra were transformed via target factor analysis to determine their analyte content.

The applicant is respectfully directed to the abstract in Haaland (047), which states, a set of hybrid least squares multivariate spectral analysis methods in which spectral shapes of components or effects not present in the original calibration step are added in a following prediction or calibration step to improve the accuracy of the estimation of the amount of the original components in the sampled mixture. The hybrid method herein means a combination of an initial calibration step with subsequent analysis by an inverse multivariate analysis method. A spectral shape herein means normally the spectral shape of a non-calibrated chemical component in the sample mixture but can also mean the spectral shapes of other sources of spectral variation, including temperature drift, shifts between spectrometers, spectrometer drift, etc. The shape can be continuous, discontinuous, or even discrete points illustrative of the particular effect.

The applicant is also respectfully directed to Haaland (047), paragraph [0031] which states; if spectral shapes are due to spectrometer drift, temperature changes,

purge gas changes, sample insertion effects, diffraction effects, or other sources of spectral change that are not due to the chemical components in the system, then the required spectral shapes can be determined through the use of repeat (sequential) samples. The best single repeat sample is generally the sample representing the center of the calibration space. In the case of a single repeat sample, the sample spectrum of the repeat sample can be obtained during the period of the calibration. This repeat sample can then represent all the environmental changes occurring during the calibration as reflected by the mid-level sample. It is known that the drift of the spectrometer looks different on different samples. Therefore, a sample that represents the calibration data is the preferred sample to use. If the sample is invariant with time, then any change in the sample spectrum will represent spectral shapes that generally have not been explicitly included in the CLS calibration. The addition of these spectral changes to the CLS calibration model will compensate for their detrimental influence on predictions. Often it is best to perform an eigenvector analysis (see C. L. Lawson and R. J. Hanson, "Solving Least Squares Problems," Prentice-Hall, Englewood Cliffs, N.J. (1974)) on the repeat sample spectra and to add only those eigenvector shapes that are detrimental to the CLS calibration. In this manner, the detrimental effects of noise on the analysis can be minimized. In addition, it is preferable to perturb the system with all parameters that are known or suspected of influencing the sample spectra. In this manner, the influence of spectrometer/system changes can be systematically included in the PACLS analysis. It is preferred that these perturbations be performed in a statistically designed manner such as a factorial or fractional

factorial design. These repeat sample spectra should be mean centered by sample. After mean centering, the spectra can be combined, and if desired, an eigenvector analysis can be performed on all mean-centered spectra in order to select only those eigenvectors that are important for reducing errors in the CLS analysis. This procedure minimizes the effects of spectral noise from the added spectral shapes. For infrared spectra of dilute solutions, a repeat sample representing the absorbing solvent (e.g., water) can be used for the repeat sample if a calibration sample or other representative sample is not available for repeat measurements.

Finally, the correction of the model for spectrometer/system drift can be obtained by collecting the repeat sample spectrum during true CLS prediction of unknown samples. The spectral shape of the difference of the repeat sample spectrum obtained during CLS calibration and prediction can be generated from the spectral difference of these repeat sample spectra. Again, if multiple repeat spectra are obtained or if multiple repeat samples are used for monitoring spectral drift of the system, then mean-centered differences and eigenvector analysis can be employed to generate the shapes added during CLS predictions. Repeat spectra taken as close as possible in time to the unknown sample spectrum should provide the best correction for drift of the system.

The examiner has interpreted from the Haaland (047) references above that the repeat spectra used in the Haaland (047) method of spectral analysis are indeed sequential drift spectra, and the algorithm of Haaland (047) performs an eigenvector analysis that provides drift compensated (drift corrected) spectra.

Argument 2.

Applicant states that "Applicants respectfully traverse the Section 103(a) rejections because the Office Action fails to present any evidence that one skilled in the art would be motivated to combine the cited Haaland, Obremski and Gupta references. A Section 103(a) rejection can only be established by combining cited references to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See, MPEP § 2143.01. The Office Action alleges various teachings in the Haaland, Obremski and Gupta references without citing any evidence in the Haaland, Obremski or Gupta reference that one skilled in the art would combine the alleged teachings to achieve Applicant's claimed invention. Absent any support, the Office Action expresses the conclusory opinion that the references are combinable."

The applicant is respectfully directed to applicant's specification page 34, line 15-23; and page 35, line 1-12; which states, The motivation for the invention will become even clearer when reference is made to FIG. 3. When prior-art methods are applied to obtain a depth profile based on the drifted spectra of FIG. 2, the results of the analysis are those shown in FIG. 3. The prior-art method for treating such sequential series of spectra is discussed in great detail in "Factor Analysis in Chemistry", Edmund R. Malinowski and Darryl G. Howery, John Wiley and Sons,1980. FIG. 3 is a target-factor profile which shows a plot of the scaled target-factor weighting factors, 300, from a

factor analysis of uncompensated Auger spectra corresponding to target factors identified with particular constituents within various layers of the sample's structure as a function of depth within the sample as measured by the cycle number, 304, in the sputter-etching sequence.

In this case, target-factor profiles provide a qualitative compositional depth profile of the distribution of constituents below the surface of the sample. The target-factor profiles are precursors to true compositional profiles that require further quantification to adjust for variations in the sensitivity of the spectrometer to spectra arising from distinct chemical constituents. Analysts often dispense with the further quantification required by compositional profiles, because the target-factor profiles qualitatively represent the relative compositional changes associated with variations in the relative amounts of distinct chemical constituents in the sample, which is more than adequate to address most questions associated with the chemical nature of the sample.

The applicant is respectfully directed to Obremski (875); Column 10, line 1-19; which states, This analysis can include the pretreatment of data representing the output signals, calibration of the detection apparatus, and the quantitative measurement of properties of unknown samples.

Processing and computations can be effected with a LabCalc^{RTM} spectroscopy software package (Version A2.22, Galactic Industries Corporation, Salem, N.H.). Spectral retrieval, storage, manipulation and display of the data, as well as the ability to process arrays and vectors representative of the data are possible with this program. Many other software programs are available to perform the spectral

analysis. For instance, there are quantitative analysis packages from Nicolet (Nicolet in Madison, Wis.), Perkin-Elmer (Norwalk, Conn.), Digilab and Pirovette (Infometrix of Seattle, Wash.). The spectral analysis procedures are well known, and are described, for example, in Factor Analysis & Chemistry by Malinowski and Howery (Wiley-Interscience 1980).

The examiner has interpreted from the above references that the applicants invention is based upon the same well known spectral analysis procedures as those utilized by Haaland (047), Obremski (875), and Gupta (586). Therefore the motivation to combine lies in the general availability of this knowledge to one of ordinary skill in the art.

Conclusion

4. The Amendment filed on 1-03-2003 under 37 CFR 1.131 has been considered but is ineffective to overcome the Haaland (047), Obremski (875), and Gupta (586) references.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip A Johnston whose telephone number is 305 7022. The examiner can normally be reached on 7:30 to 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 703 308 4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872 9318 for regular communications and 703 872 9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

PJ
November 7, 2003